- The Commission had substantial information before it on the operation of AVM technology, including pulse-ranging technology, and as the 1974 AVM Report and Order emphasized, "the state of the vehicle location art and the needs for the practical application of AVM techniques have progressed dramatically [during the inquiry]."[3]

1. The First Notice of Inquiry

The Commission's first Notice of Inquiry was adopted August 21, 1968. The Commission expressly instituted inquiry on the following question:

> In a single metropolitan area should a multiplicity of locator systems be permitted or should service to all users be provided by a single system? What will be the impact on spectrum usage resulting from a policy permitting multiple systems, in a single locality?[4]

The Commission asked further whether "if a single system is utilized, what type of operating entity should be authorized e.g., common carrier, a number of users jointly, a user cooperative, or some other entity?"[5]

The Commission received a number of comments addressed to these issues. The Institute of Public Administration (IPA) was, at the time, studying alternative institutional and technical configurations for a public urban locator service for the U.S. Department of Housing and Urban Development. IPA noted several arguments in favor of a single system. It reduced the cost to

would result from redundant systems. The IPA comments noted further that pulse ranging systems need at least 5 MHz to operate, and suggested a single system would "prevent a plethora of high cost, inefficient special purpose systems from preempting the spectrum."[6]

The Hazeltine Corporation, which was developing pulse-ranging AVM systems for municipal police, fire, and transit agencies, commented that "[p]ulse ranging is generally considered to be the most flexible and accurate of the AVM systems, especially for the random location of large numbers of vehicles."[7] It was "obvious even now" that "[l]imitation of location systems to one or two types which are fully utilized is more economical and conserves frequency space better than permitting a multiplicity of partially utilized systems."[8]

Comments of Motorola, Inc., also reflected the clear understanding that wideband pulse-ranging systems would not share

spectrum in other than Land Mobile bands.[9]

Other comments also noted that two systems could not share spectrum.[10]

2. The Hazeltine Petition for Rulemaking

In December, 1970, Hazeltine filed a petition for a rulemaking, requesting rules that would allow it to establish a pulse-ranging AVM system providing vehicle location and status information for vehicle dispatchers.[11] Hazeltine proposed a service area with a 25-mile radius. The petition listed a variety of potential uses for such a system, including reporting, command, and control requirements for police, fire, and ambulance users, and mass transportation and trucking applications.

The Hazeltine petition proposed use of the 902-928 MHz band

> the vehicle monitoring information needs of tens of thousands of vehicles in a large population center. Furthermore, there is sufficient bandwidth in the proposed allocation to permit two pulse systems in the same area, each using 10 MHz of bandwidth, with 6 MHz of separation (the ISM mid-band) between them. It is unlikely that the market would support more than two high-capacity services in the same area. Similarly, since transmissions at the frequencies under discussion are line-of-sight, there is small likelihood of interference between systems operating in separate large population centers. But in the event of two independent systems operating in centers close enough so that interference by line-of-sight transmission is possible, two different 10 MHz systems could operate without mutual interference.[12]

The Hazeltine petition thus expressly advanced co-channel separation as the method for eliminating interference between separate wideband pulse-ranging systems in the same area.

Numerous comments were received in support of the Hazeltine petition. None even suggested that two or more wideband pulse-ranging systems could share spectrum. The Automobile Club of Southern California, for example, read Hazeltine's proposal as one which "would require interference-free assignment in the 902-928 MHz band."[13] Similarly, the American Trucking Associations (ATA)

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[12] Id. at 29-30.

[13] Supporting Comment of the Automobile Club of Southern California, RM-1734, filed Feb. 1, 1971, at 5. The Club also noted that other systems, such as narrowband systems, might be able to operate on other frequencies in the VHF and UHF bands. Other comments also suggested the Commission not preclude development of other systems outside the 902-928 MHz band by adopting Hazeltine's proposal for the 902-928 MHz band. See, e.g., Comments of the Int'l Ass'n of Chiefs of Police Inc., RM-1734, filed Feb. 18, 1971

noted that assignment of the 902-928 MHz band for the Hazeltine system was appropriate because "multiple use . . . does not appear to be practicable in the land mobile portions of the spectrum because of the comparatively wide bandwidth requirement of the AVM system which would preempt needed voice frequencies."[14]

3. The Further Notice of Inquiry

In June, 1972, the Commission issued a further notice of inquiry and notice of proposed rulemaking with regard to AVM systems. This notice referenced Hazeltine's petition prominently, noting that the proposal would permit "two pulse systems in the same area, each using 10 MHz of bandwidth."[15] In its further notice, the Commission again queried: "Should a multiplicity of locator systems be authorized in a single metropolitan area or should service to all users be provided by a single system?"[16]

Again, comments received in response to the Further Notice reflected the premise that multiple wideband systems sharing frequency were neither feasible nor desirable. Hazeltine's further comments noted that scale economies would militate against multiple AVM systems in contiguous areas. However, it suggested that if, at some point, there were two systems in contiguous areas, interference could be avoided at these borders

> by alternating the assignment of two carrier frequencies to AVM systems assigned along megalopolitan corridors, such as Boston-

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[14] Supporting Comment of ATA, RM-1734, filed Feb. 16, 1971, at 2.

[15] 35 F.C.C.2d 692 (1972).

[16]

> Washington. If the band 902-928 MHz is allocated for AVM, the center frequencies of two 10 MHz bands might be established as 907 and 923 MHz, leaving a 6 MHz guard between alternate assigned bands.[17]

Hazeltine also proposed that the 6 MHz between the 10 MHz bands be allocated to narrowband low-capacity systems. "The 26 MHz allocation requested in the Hazeltine petition (in a band not now used for any communications purpose) is intended to accommodate two wide-band as well as several narrow-band systems to meet a wide variety of user requirements in a single geographic area."[18]

Capital Scientific Corporation commented that

> we are not aware of any system in which the cost of separate systems, both in terms of dollars and amount of spectrum required, would not be considerably greater for separate systems than for a combined single system. Therefore, the number of separate systems should be limited to a very few.[19]

The Commission adopted interim rules in response to this further notice in 1974. The rules substantially followed the Hazeltine proposal, except that they reduced the bandwidth for the wideband systems from 10 MHz to 8 MHz. The Commission noted that it was allowing two wideband systems to be developed by allocating

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[17] Further Comments of Hazeltine Corp., Docket No. 18302, RM-1734, filed Dec. 14, 1972, at 14.

[18] Reply Comments of Hazeltine Corp., Docket No. 18302, RM-1734, filed Dec. 29, 1972, at 2.

[19] Comments of Capital Scientific Systems, Docket No. 18302, RM-1734, filed Dec. 15, 1972, at 7. Another commenter noted similarly that "[i]n considering the Novatek system, it seems important to seize on the cost-sharing and frequency-economizing virtues of a single system." Comments of Novatek, Inc., Docket No, 18302, RM-1734, filed Dec. 12, 1972, at 6.

904-912 and 918-926 MHz for such systems.[20] The Commission also took account of comments that other AVM technologies should be permitted, and allocated the 903-904 and 926-927 MHz bands to "encompass also those AVM techniques, other than the wideband method, which are able to tolerate possible interference from ISM or government operations."[21]

4. Conclusion

The Commission gave substantial attention to the problem of exclusivity in adopting the interim 1974 rules. The proposals for pulse-ranging systems it had before it presumed such exclusivity. Many of the comments noted the substantial scale economies and spectrum efficiency that militated for one, or at most a very small number, of AVM systems. The Commission's action in providing for two wideband pulse-ranging AVM systems in each docket, on separate bands, adopted this common understanding.

To the extent that comments leading to the 1974 rules expressed uncertainty as to whether there should be a single system in each market, the uncertainty primarily reflected the view that wideband technology was at the time relatively unproven, and that the Commission should not preclude development of narrowband alternatives as well. The Commission incorporated this view by licensing narrowband systems on the 903-904 and 926-927 MHz bands. There is no discussion in the 1974 AVM Report and Order, or in any of the proceedings and comments leading up to it, of any intention

to allow multiple wideband systems to share frequencies of any